

## **High resolution statistical downscaling of the EUROSIP seasonal prediction. Application for southeastern Romania**

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Seasonal climate forecasts in Europe are currently issued at the European Centre for Medium-Range Weather Forecasts (ECMWF) in the form of multi-model ensemble predictions available within the “EUROSIP” system. Different statistical techniques to calibrate, downscale and combine the EUROSIP direct model output are used to optimize the quality of the final probabilistic forecasts.

In this study, a statistical downscaling model (SDM) based on canonical correlation analysis (CCA) is used to downscale the EUROSIP seasonal forecast at a spatial resolution of 1km x 1km over the Movila farm placed in southeastern Romania. This application is achieved in the framework of the H2020 MOSES project (<http://www.moses-project.eu>). The combination between monthly standardized values of three climate variables (maximum/minimum temperatures-Tmax/Tmin, total precipitation-Prec) is used as predictand while combinations of various large-scale predictors are tested in terms of their availability as outputs in the seasonal EUROSIP probabilistic forecasting (sea level pressure, temperature at 850 hPa and geopotential height at 500 hPa). The predictors are taken from the ECMWF system considering 15 members of the ensemble, for which the hindcasts since 1991 until present are available. The model was calibrated over the period 1991-2014 and predictions for summers 2015 and 2016 were achieved. The calibration was made for the ensemble average as well as for each ensemble member. The model was developed for each lead time: one month anticipation for June, two months anticipation for July and three months anticipation for August. The main conclusions from these preliminary results are: best predictions (in terms of the anomaly sign) for Tmax (July-2 months anticipation, August-3 months anticipation) for both years (2015, 2016); for Tmin - good predictions only for August (3 months anticipation) for both years; for precipitation, good predictions for July (2 months anticipation) in 2015 and August (3 months anticipation) in 2016; failed prediction for June (1-month anticipation) for all parameters. To see if the results obtained for 2015 and 2016 summers are in agreement with the general ECMWF model performance in forecast of the three predictors used in the CCA SDM calibration, the mean bias and root mean square errors (RMSE) calculated over the entire period in each grid point, for each ensemble member and ensemble average were computed. The obtained results are confirmed, showing highest ECMWF performance in forecasting of the three predictors for 3 months anticipation (August) and lowest performance for one month anticipation (June). The added value of the CCA SDM in forecasting local Tmax/Tmin and total precipitation was compared to the ECMWF performance using nearest grid point method. Comparisons were performed for the 1991-2014 period, taking into account the forecast made in May for July. An important improvement was found for the CCA SDM predictions in terms of the RMSE value (computed against observations) for Tmax/Tmin and less for precipitation. The tests are in progress for the other summer months (June, July).